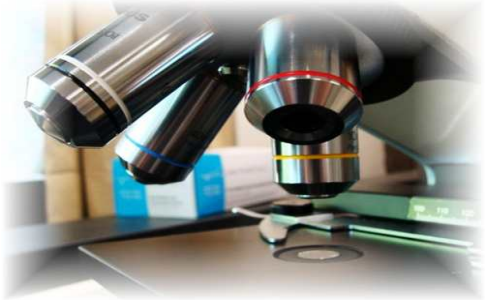


About Science Prof Online PowerPoint Resources

• Science Prof Online (SPO) is a free science education website that provides fully-developed Virtual Science Classrooms, science-related PowerPoints, articles and images. The site is designed to be a helpful resource for students, educators, and anyone interested in learning about science.

• The SPO Virtual Classrooms offer many educational resources, including practice test questions, review questions, lecture PowerPoints, video tutorials, sample assignments and course syllabi. New materials are continually being developed, so check back frequently, or follow us on Facebook (Science Prof Online) or Twitter (ScienceProfSPO) for updates.

• Many SPO PowerPoints are available in a variety of formats, such as fully editable PowerPoint files, as well as uneditable versions in smaller file sizes, such as PowerPoint Shows and Portable Document Format (.pdf), for ease of printing.

• Images used on this resource, and on the SPO website are, wherever possible, credited and linked to their source. Any words underlined and appearing in blue are links that can be clicked on for more information. PowerPoints must be viewed in *slide show mode* to use the hyperlinks directly.

• Several helpful links to fun and interactive learning tools are included throughout the PPT and on the Smart Links slide, near the end of each presentation. You must be in *slide show mode* to utilize hyperlinks and animations.

Alicia Cepaitis, MS
Chief Creative Nerd
Science Prof Online
Online Education Resources, LLC
alicia@scienceprofonline.com

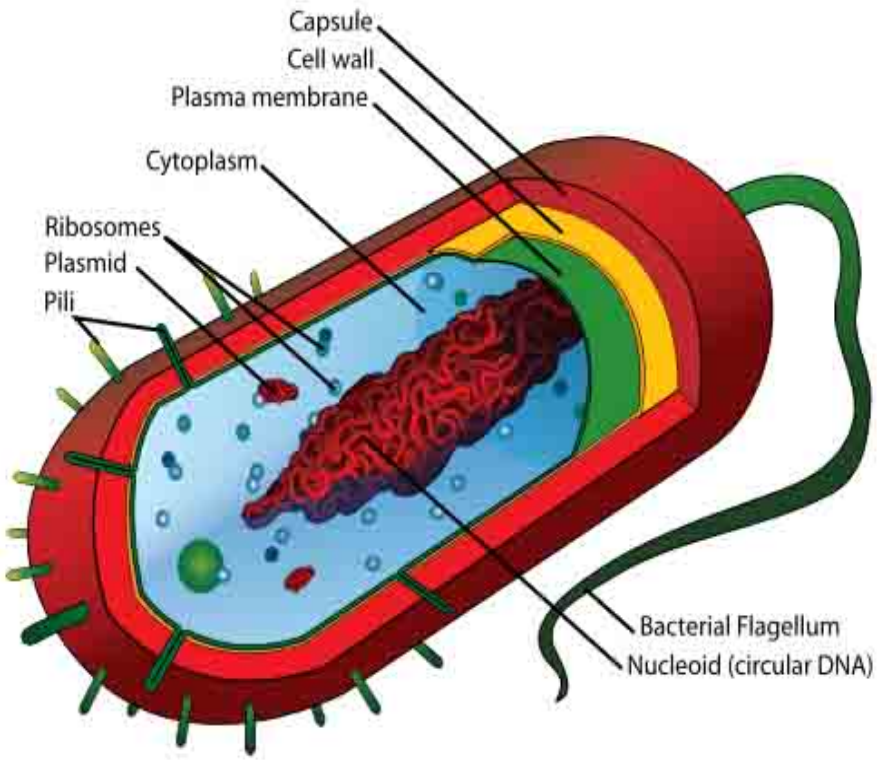
Tami Port, MS
Creator of Science Prof Online
Chief Executive Nerd
Science Prof Online
Online Education Resources, LLC
info@scienceprofonline.com

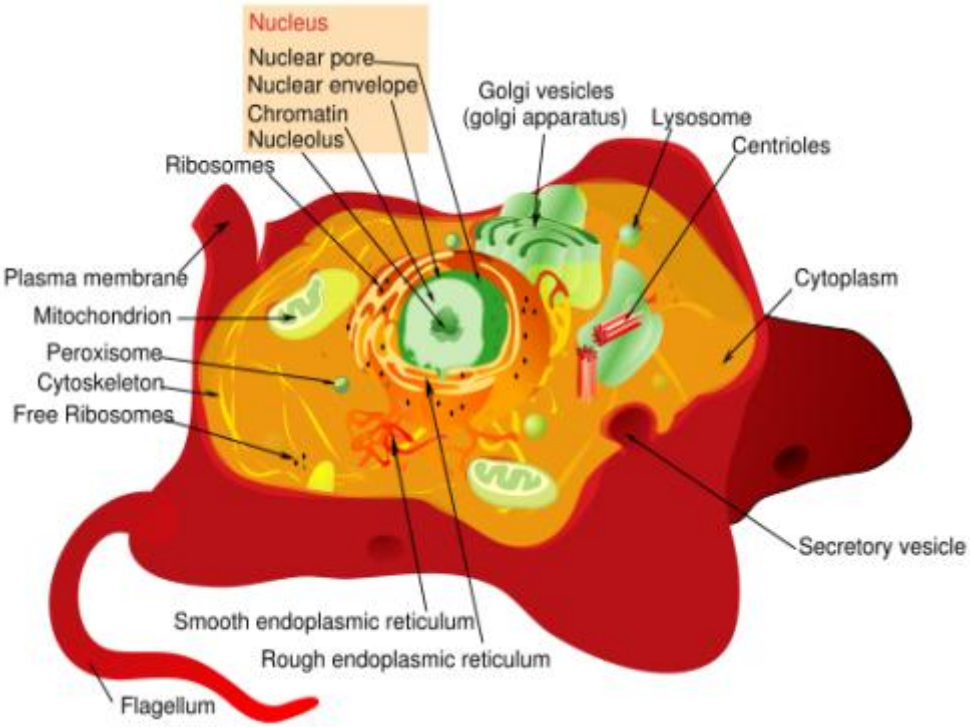
Image: Compound **microscope objectives, T. Port**

Early Embryonic Development

Image: Morula, Wiki.

Two Basic Types of Cells





Prokaryotic Cell

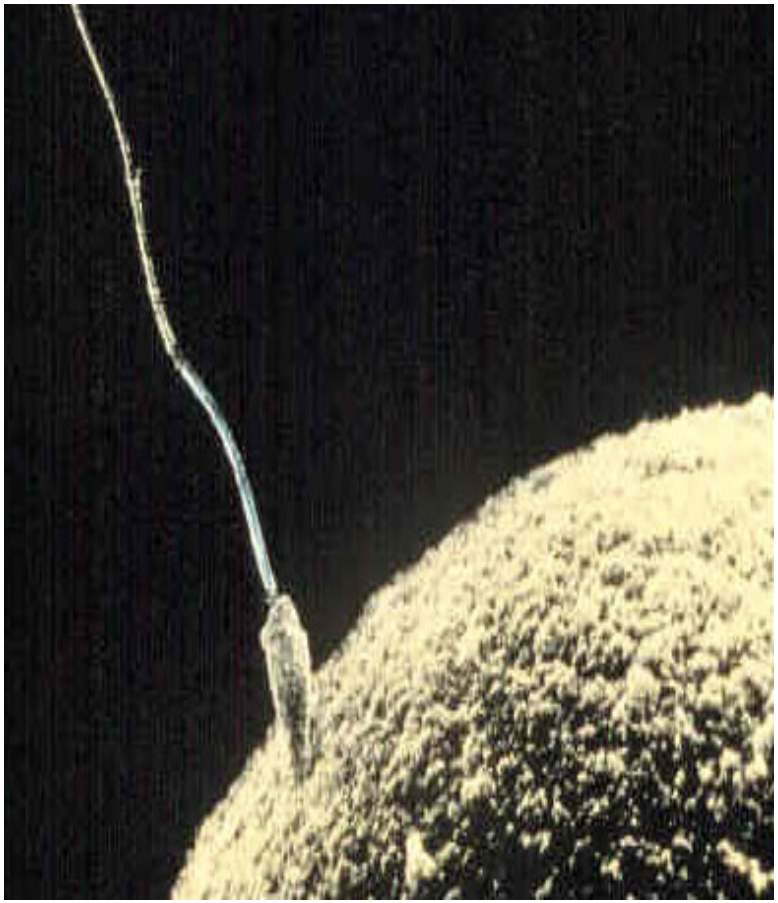
WATCH THIS!

Introduction to Cells Video

Eukaryotic Cell

Images: Prokaryotic cell diagram & Eukaryotic cell diagram, M. Ruiz

You Started Out As a Tiny Fertilized Egg!



So How Did You Become This?

Image: Sperm fertilizing egg, Wiki; Goofy kid, T. Port

Mitosis

4 sub-phases:

1st – Prophase

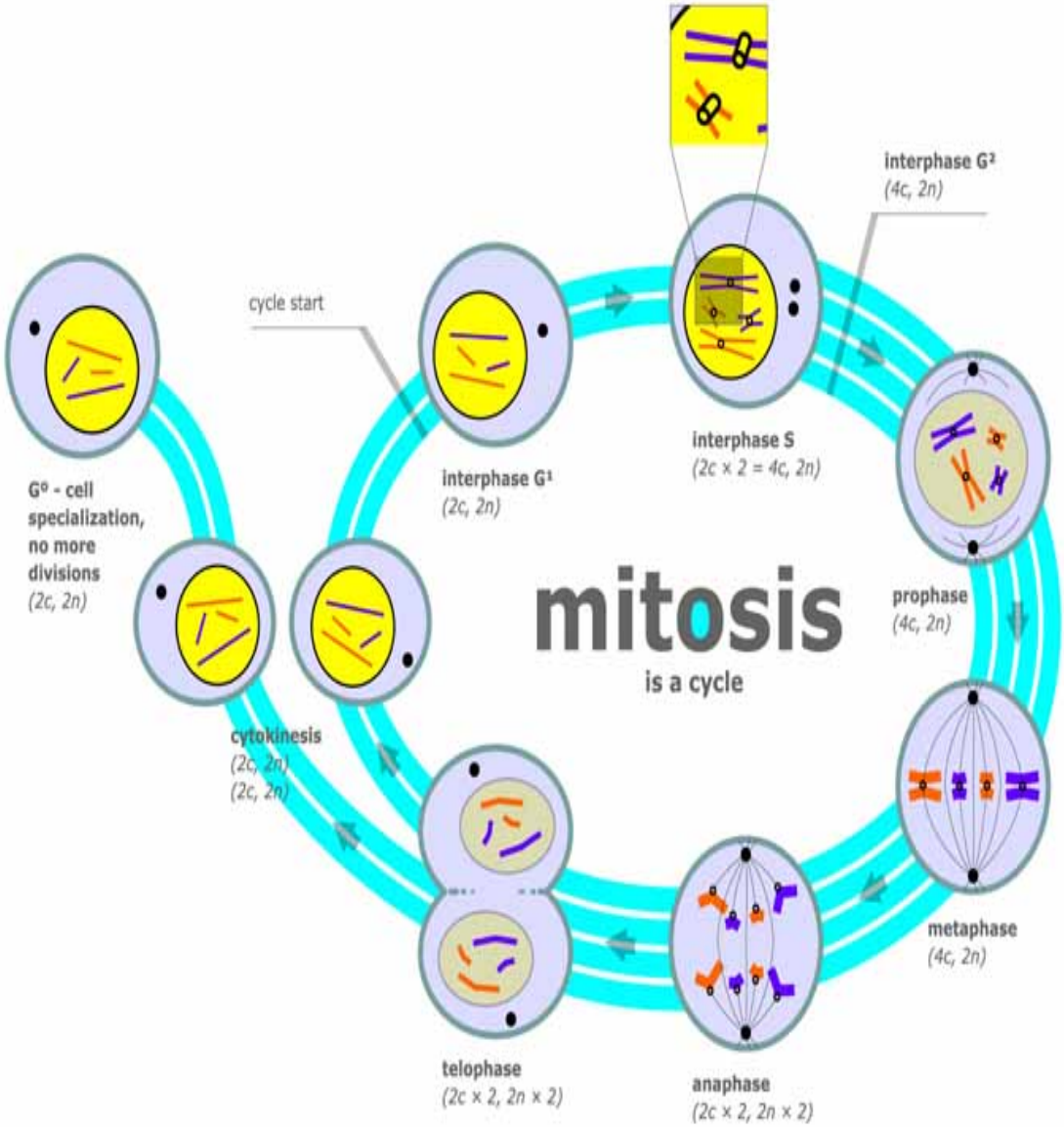
2nd – Metaphase

3rd – Anaphase

4th – Telophase

followed by

Cytokinesis



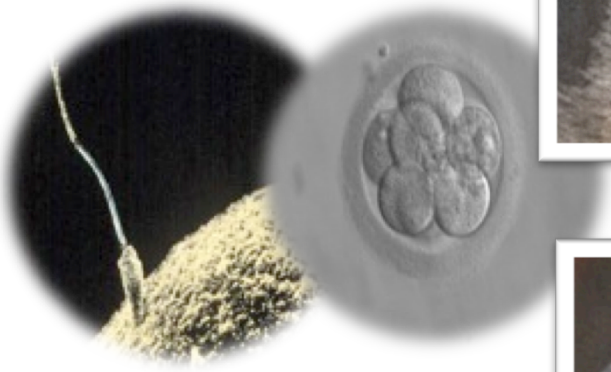
Secret to remembering phases in order…

Image: Mitosis diagram, Marek Kultys

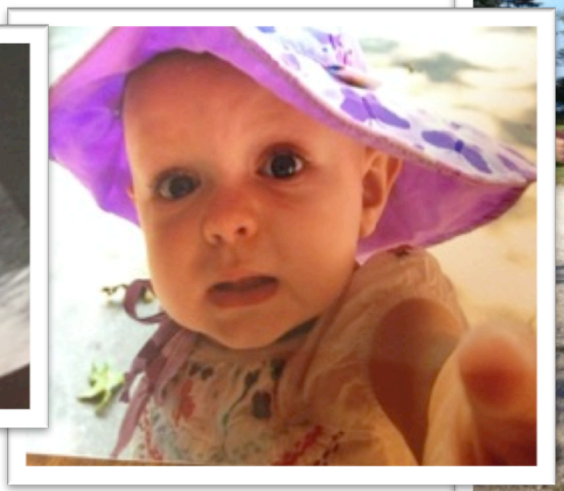
From the Virtual Biology Classroom on ScienceProfOnline.com

Mitosis *(Eukaryotic Cell Division)* allows for growth and development in multicellular organisms.

Growth requires more cells.



Development requires specialization of cells.



Images: Sperm & egg, Wikipedia;; Morula, Wiki; My son and daughter, T. Port

In sexually reproducing organisms, growth & development starts with fertilization, a sperm fusing with an egg (ovum).

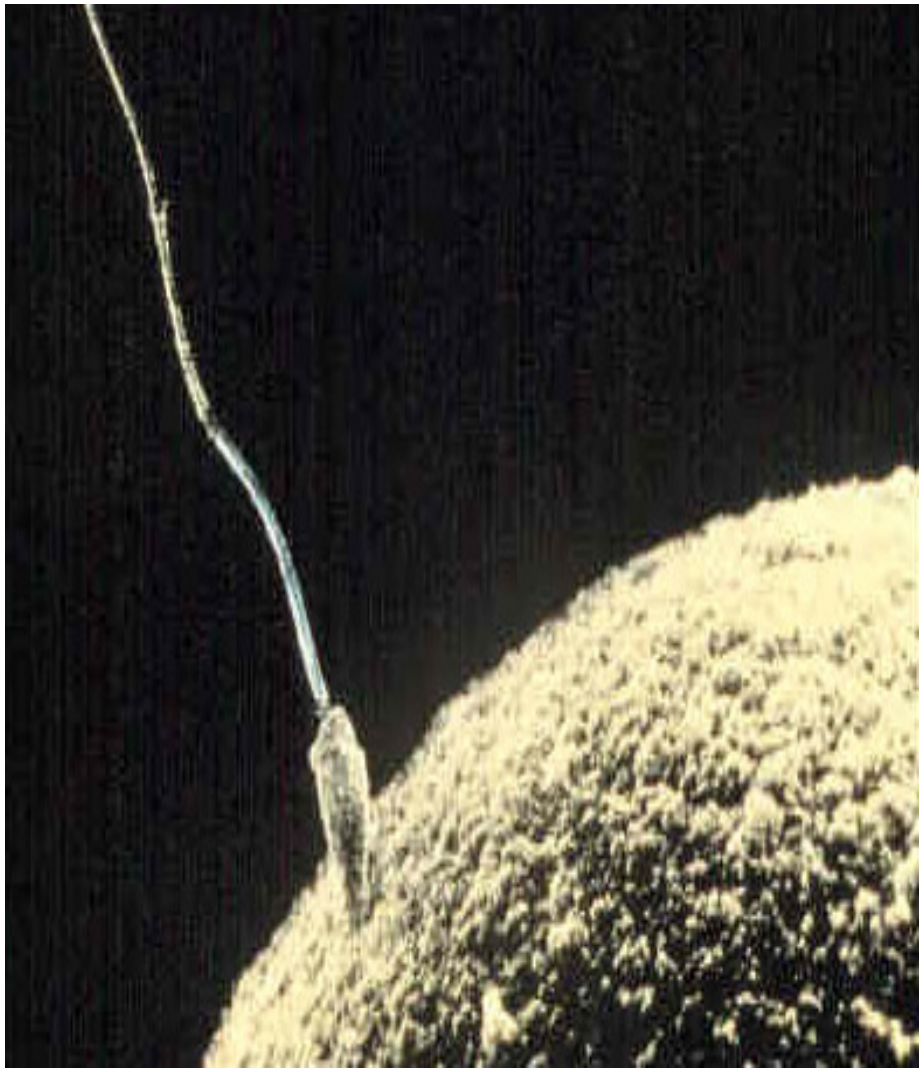


Image: Sperm fertilizing egg, Wiki

A: Egg surrounded by sperm. On right side of egg, one sperm has just penetrated the egg membranes and is entering cytoplasm; egg nucleus in the center. After one sperm has fertilized the egg (the winner!), chemical changes occur in the egg membrane that prevent any more sperm from entering.

B & C: Egg nucleus on left. Sperm nucleus on right.

D: Chromosomes of egg and sperm nuclei clearly visible (egg chromosomes in black, sperm chromosomes shaded).

E: Duplicated chromosomes line up at the cells equator prior to separating and moving to opposite poles.

F: Completion of first cleavage, two-celled stage, each nucleus showing four chromosomes, two from the egg and two from the sperm.

Only 4 chromosomes are pictured in this example. **Q:** How many chromosomes do we have?

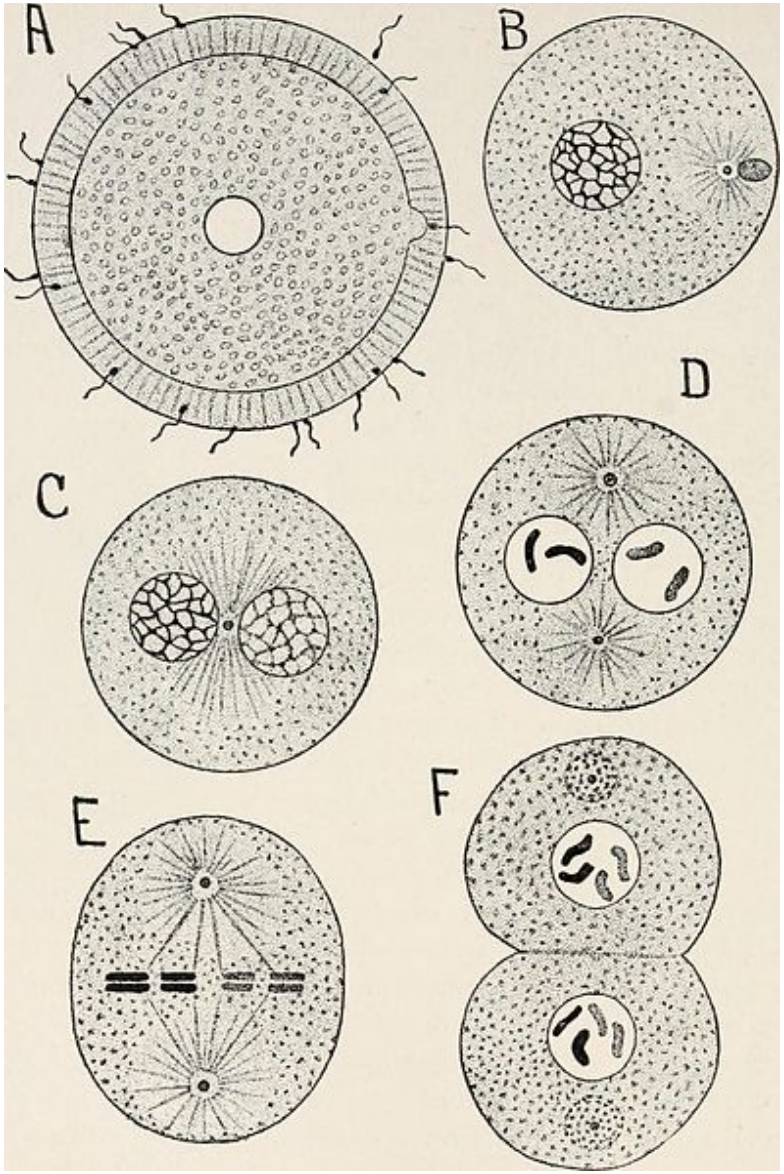
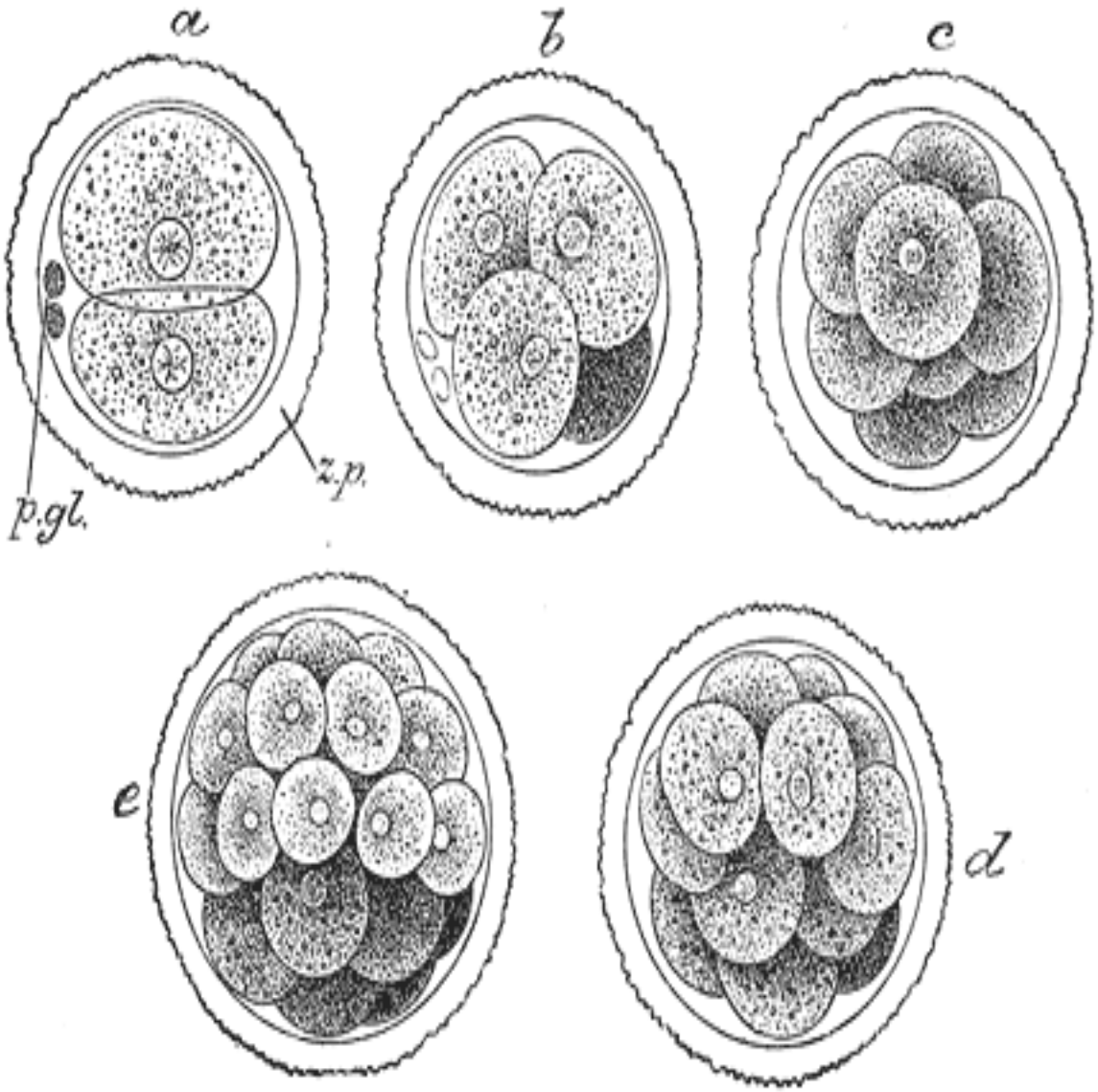


Image: Events immediately following fertilization, Wiki



Early stages of division of mammalian embryo.

a. Two-cell stage.
(z.p. Zona striata. p.gl. Polar bodies.)

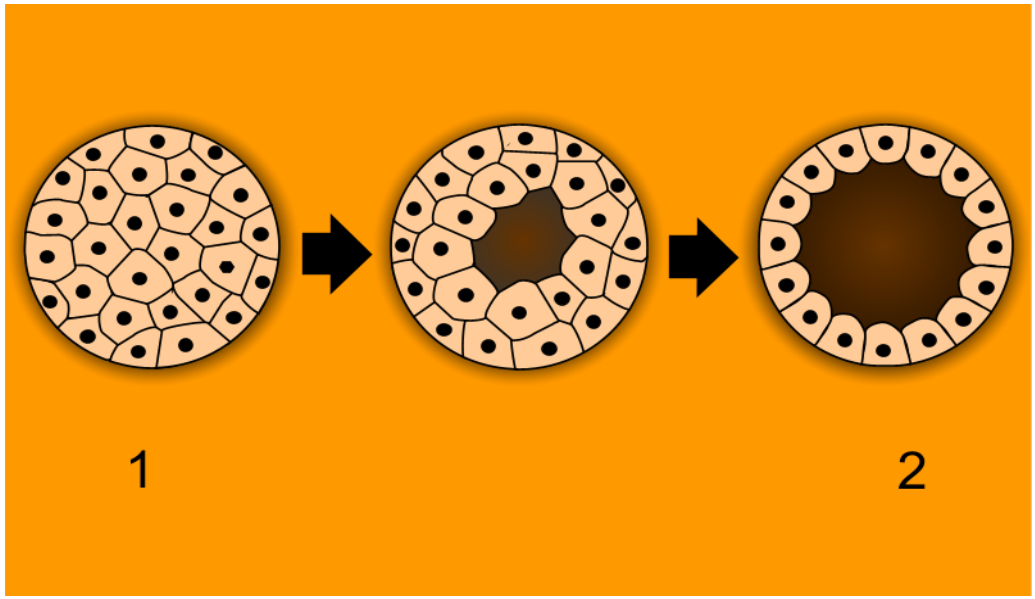
b. Four-cell stage.

c. Eight-cell stage.

d & **e**. Morula stage.
Once the embryo has divided into 16 cells, it begins to resemble a mulberry, hence the name morula (Latin, morus: mulberry).

Image: First stages of cell division in mammalian embryo, Wiki.

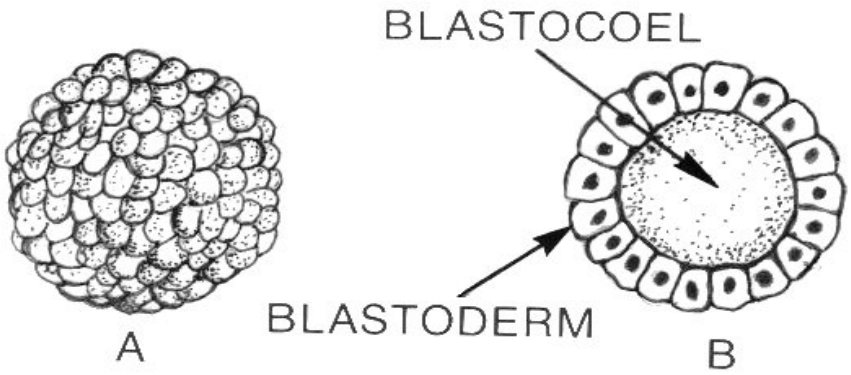
Blastulation



1. Morula

----->

2. Blastula
("little bladder")



A. View of the outside of a blastula.

B. Cross section of blastula.

Images: Blastulation, Wiki,
External view and cross-section of blastula, Wiki

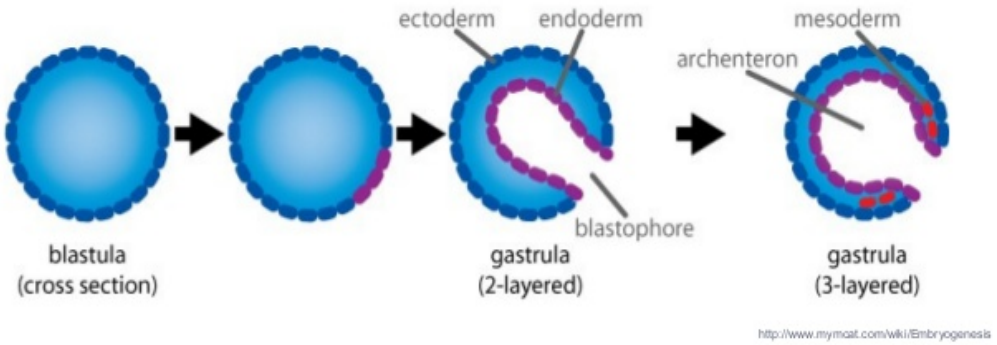
Gastrulation

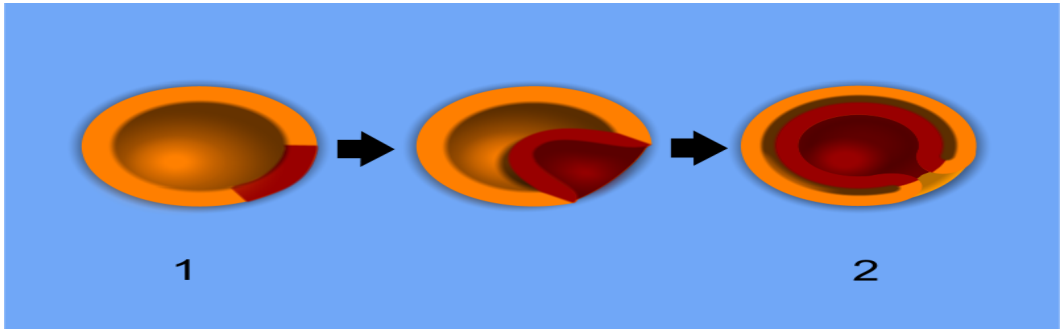
Occurs when a blastula (made up of one layer) folds inward and enlarges to create a gastrula ("little stomach").

A gastrula has 3 germ layers: the ectoderm, the mesoderm, and the endoderm. Some of the ectoderm cells from the blastula collapse inward and form the endoderm. The blastopore is the hole created.

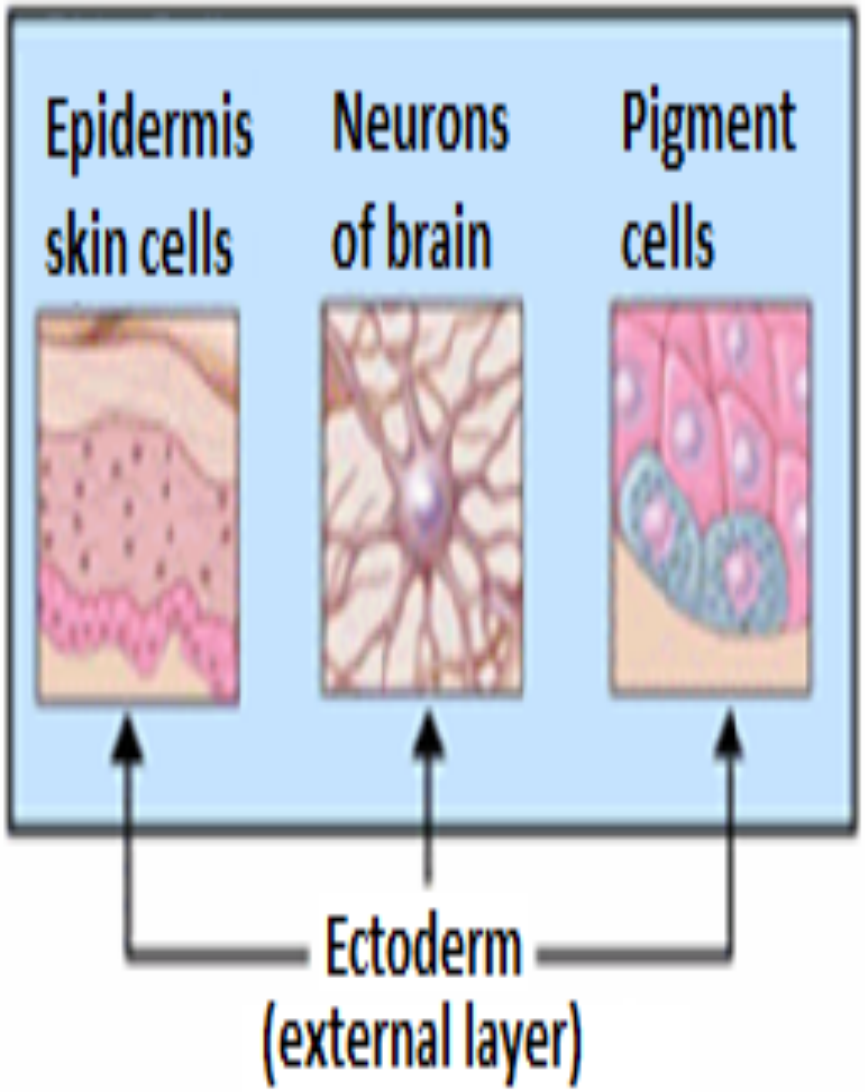
Embryogenesis: Gastrulation

- Gastrula is composed of 3 germ layers:
  - Outer: Ectoderm
  - Middle: Mesoderm
  - Inner: Endoderm





Images: Gastrulation schematic, Wiki

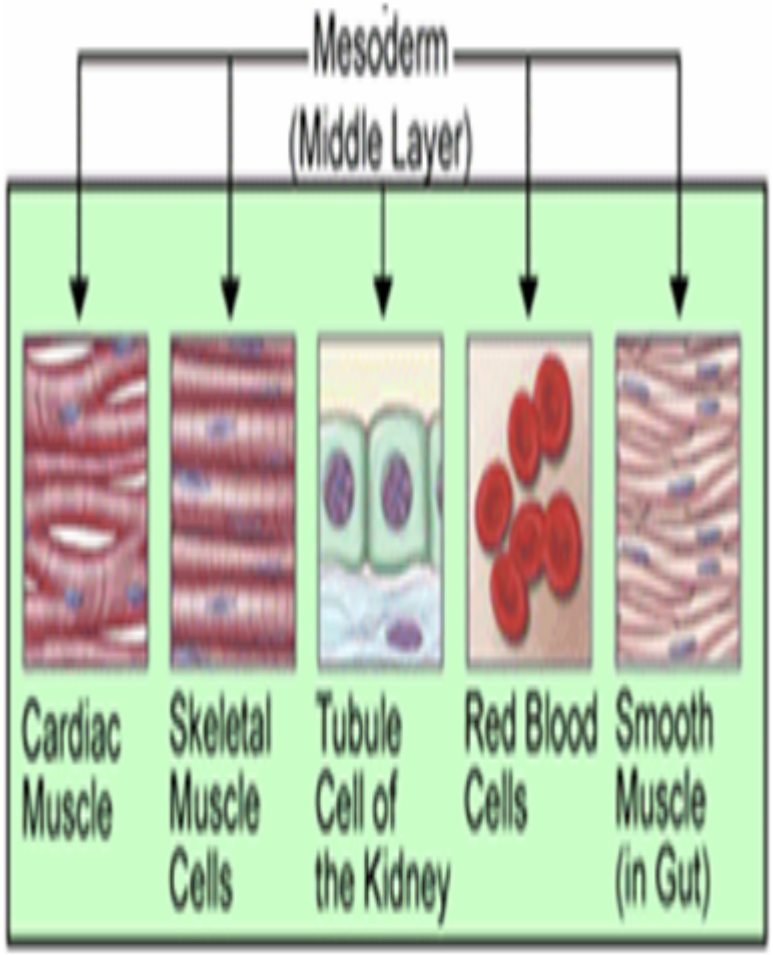


Ectoderm

Differentiates into the entire nervous system (spine, peripheral nerves and brain), as well as various external tissues, such as hair, nails, tooth enamel and the outer layer of skin (epidermis).

Also forms the lining of mouth, anus, nostrils, sweat glands, hair and nails.

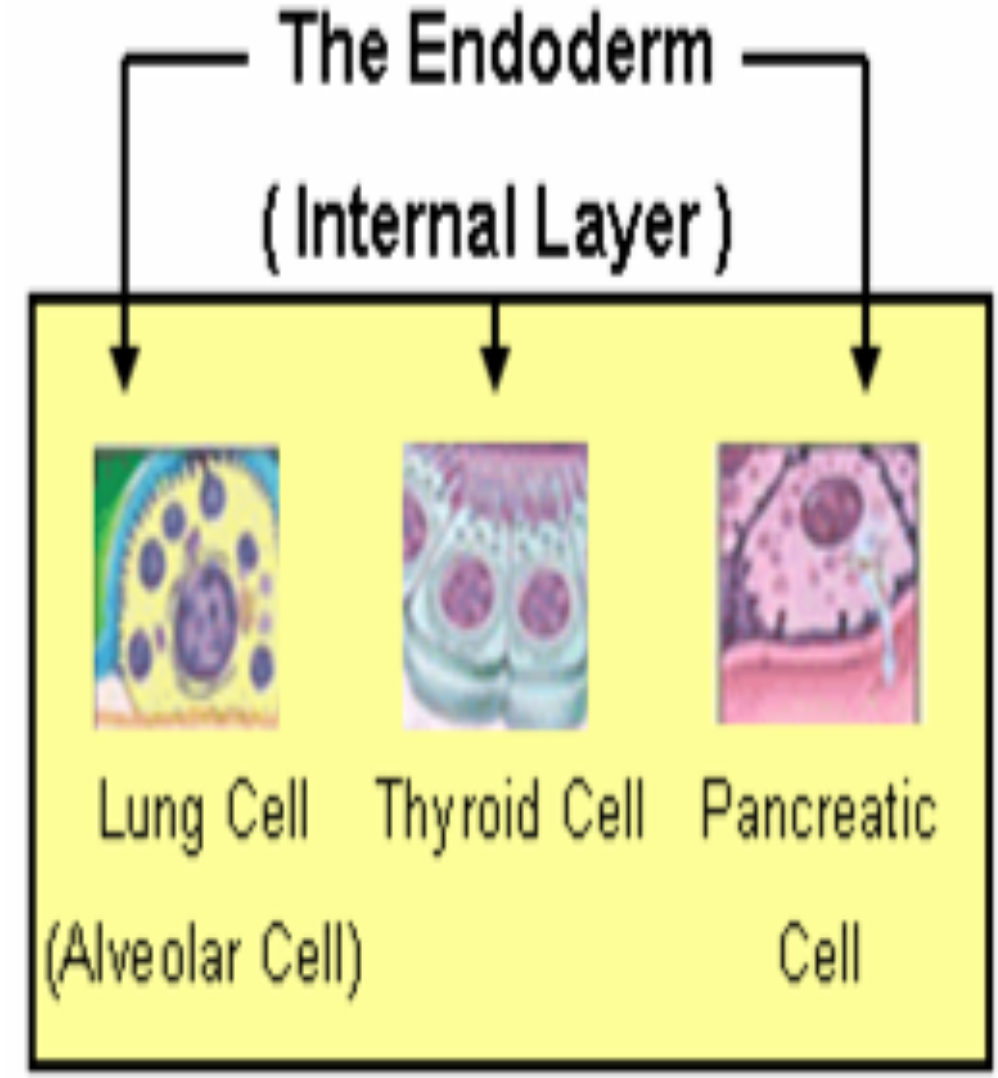
Image: Ectoderm, Wiki



Mesoderm

In vertebrates, the mesoderm gives rise to much of the body's mass, including muscle, connective tissue, cartilage, bone and blood.

Image: Mesoderm, Wiki



Endoderm

Develops into interior organs and tissues, such as the interior linings of two tubes in the body, the digestive and respiratory tube and associated organs.

Images: Gastrulation schematic, Wiki

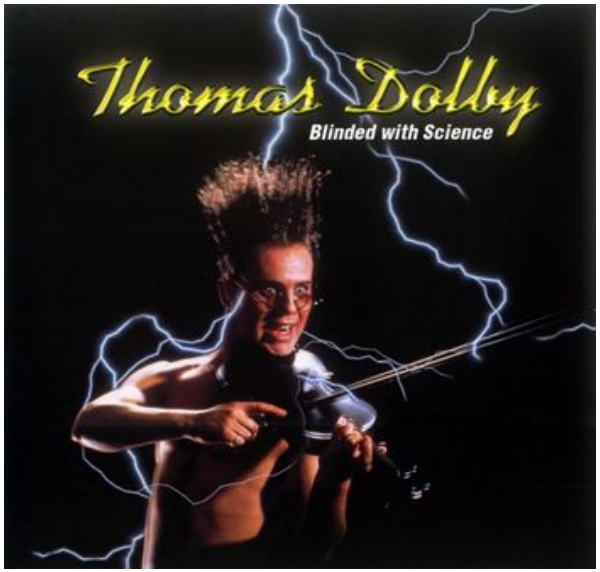
Confused?

Here are some links to fun resources that further explain **Embryogenesis**:

- Animation of Early Embryogenesis
- Embryo Development up to Blastocyst
- IVF Development of Embryo Up to 5 Days
- Development of a Frog

(You must be in PPT slideshow view to click on links.)

Smart Links

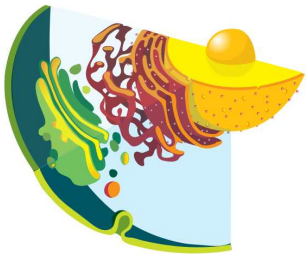


Are you feeling blinded by science?

Do yourself a favor. Use the…

Virtual Biology Classroom *(VCBC)* !

The VBC is full of resources to help you succeed, including:



- practice test questions
- review questions
- study guides and learning objectives
- PowerPoints on other topics

You can access the VCBC by going to the Science Prof Online website
www.ScienceProfOnline.com

Images: Blinded With Science album, Thomas Dolby; Endomembrane system, Mariana Ruiz, Wiki